1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

133X breadth. Its waters are extremely bitter. On its shore [172] Captain H. Strachey likewise found fossil shells of the *Lymnæa auricularia* and of some kind of *Helix*, of which the specimens are perhaps too small to be identified with certainty. The waters of this lake must, therefore, once have been fresh.

133X The *Tshomoriri*,* or "Mountain Lake," is a very fine 103 sheet of water, about sixteen miles in length from north to south, and from two to three miles in breadth. It is situated in the middle of the elevated district of Rukchu, in N. latitude 32° 50′, and E. longitude 78° 15′, at a height of 15,000 feet above the sea. Its name is characteristic of its situation in the midst of mountains, by which it is completely shut in. The summits of these mountains rise to a height of about 5,000 feet above the 823 lake, and 20,000 above the sea. To account for its name, 103 the Ladakis have invented a story, which though silly enough, is quite as good as many that have been gravely recorded by learned Greeks. The story was probably originated by the inventive Kashmiris. "A woman riding a yák was carried into the lake. At first the yák swam boldly out, and the woman was delighted: but after a time the animal grew tired, and sank deeper in the water. The woman (*chomo*) became frightened, and screamed out *Ri-Ri*, *Ri-Ri*,† until the yák sank and she

* *Tsho-mo-Rhi-ri*, "Lake Mountainous."—Running water, being active, is considered as a male, as *Tsang-po*, the river of *Tsang*;—and still water, being passive, as a female, as *Tsho-mo*. *Po* and *Mo* are the masculine and feminine affixes, but they are seldom used in composition. *Ri* is a mountain; and *Rhi-ri-yi*, or simply *Rhi-ri*, is the adjective, mountainous.

† *A-ra-ra*, commonly pronounced *Re-re*, or *Ri-ri*, is the Tibetan exclamation of surprise or fear. As the word is written with an initial vowel, it is certainly borrowed from the Indian *Ari-ari*, for there is no word in the Tibetan language beginning with a vowel that is not of foreign origin.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

rocky promontory juts out into the lake, the water is very deep. On the north and east sides it is shallow; but on the west, the steep slope of the mountains appears to be continued beneath the surface. The water is exceedingly brackish and bitter, and the whole of the ground on the south-eastern shore glitters with a saline matter, which forms a thick crust of some extent. The southern road passes over this vast cake of salt, which cracks and crunches beneath the feet of the traveller. The salt is natron, or sub-carbonate of soda. On all sides the mountains still retain the ancient beach-marks in distinct lines, at all heights up to about 150 feet above the present level of the lake. In the numerous deposits of fine alluvial clay, both white and yellow, we found myriads of fossil shells of the *Lymnæa auricularia*, and a few specimens of a *Cyclas*, preserved inside the Lymnæa. When these animals existed, the lake must have formed a vast sheet of fresh water with a narrow passage to the westward, which connected it with a second and larger lake, that must have covered the whole of the present plain from Kyang, from the foot of the Thung Lung Pass to the forks of the Sum Gal river, a length of about thirty-five miles. In the clay deposits of this plain, as well as in the connecting gorge, we found myriads of the same fossil shells (*Lymnæa auricularia*) before mentioned. The Tsho-kar lake abounds with many kinds of water-fowl, especially with wild geese and wild ducks. To the south of the Tsho-kar there is a small fresh-water lake of no great depth, that supplies the salt-water lake. It is a very favourite haunt of the *Kyang*, or wild horse.

The *Yunam Tsho* is a small sheet of fresh water in the

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

VII.—SUPPOSED MILDNESS OF FORMER CLIMATE.

/32 Various circumstances induce me to believe that the climate of Ladák was formerly much milder and much
● /72 less dry than it is at present. The occurrence of vast quantities of fossil *fresh-water* shells in the sandy alluvium above the level of the present *salt-water* lakes of Ladák, proves that these lakes must once have been very extensive sheets of fresh water. In the case of the *Tsho-kar* or "White Lake," this is proved beyond all doubt, by the occurrence of fossil shells on the plain of Kyang, and in the deep gorge through which the waters of the lake once had exit into this place. As the plain itself had a gradual slope from the foot of the Thung-Lung Pass to the Sumgal River, the whole extent of this double lake can be seen by a glance at the accompanying sketch-map,* which illustrates the ancient lake system of Ladák in those parts of the country which I have visited.

/33 1. The *Kyang-Tsho* formerly extended from the foot of the Thung-Lung Pass to near the source of the Sumgal River, a length of thirty-five miles. It is difficult to ascertain the mean breadth, but it must have been about five miles. This would give an area of 175 square miles.

2. The *Tsho-kar* formerly flowed into the Kyang-Tsho, and was about twenty-five miles in length by five miles in breadth. The old beach-marks are distinctly visible on the mountain-sides, both to the north and south of the lake. I traversed along the southern end of the Tsho-kar in two different directions in 1846, and in 1847 along the northern end, and through the gorge which

* See Plate VI.

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

133 been covered with water for some miles above Marchalang down to Lé and Pitak. At Pitak, the lacustrine deposits of fine clay are still adhering to the rocks in horizontal strata, to a height of 750 feet above the level of the river. The whole extent must have been about thirty-five miles by six miles, or 210 square miles. Below Pitak, the former channel of the Indus can be traced for many miles, by Phyang and Tharu, to Nyimo.

It is impossible to say what may have been the whole extent of the former lakes of Ladák, but as the ancient lakes of Rukchu, which I have described, must have covered a space of 840 square miles, or nearly one-sixth of the whole extent of the district, a vague idea may be formed of the general extent of the lake system, which must once have prevailed over Ladák. The vast lake of Pang-kong was probably not less than twenty miles in breadth by 100 miles in length, and must have covered an area of 2,000 square miles. This lake, with the others which I have described, would have occupied about one-tenth of the whole extent of the country.

The former existence of these vast sheets of fresh water rests neither upon general appearances nor upon the vague assertions of tradition, but upon the distinct evidences of vast beds of fine clay, which are found adhering to the rocks in horizontal strata, and which could only have been deposited in comparatively still water. Their existence is further proved by the [172] abundance of fossil *fresh-water* shells that are found in the sandy clay deposits around the present *salt-water* lakes, and on the dry plain of Kyang. These shells are of two kinds,—*Lymnæa auricularia* of all sizes, and

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

Cyclas rivicola, which is only found of very small size preserved in the interior of the larger shells.* As these mollusca do not now exist in Ladák at a greater elevation than between eleven and twelve thousand feet, it seems a probable conclusion that the country must at some former period have enjoyed a very much milder climate than that of the present day. This conclusion might indeed have been deduced from the former existence of the vast lakes which have been described. For the waters vapourized by the sun must have been condensed by the cold of night, and the plains would then have been fertilized by rain, and the mountains covered by snow. Numerous streams would have flowed down the hill-sides in all directions, and the overflowing lakes would have formed mighty rivers.

Throughout Ladák there are numbers of vast ravines, many of them 500 feet deep, and as many yards broad, which could not possibly have been formed by the scanty brooks that are now nearly lost in their meanderings from side to side of these enormous channels. In one of these vast river-beds the scanty rill of the Sum-gal now purls along at the southern end of the plain of Kyang. The sides of this channel are masses of alluvial boulders and gravel, which once formed the bed of the Kyang-Tsho. The rocky barrier, below the junction of the Sum-gal rivers, was probably worn away, gradually at first, until the plain of Kyang became almost dry: after which, on the occurrence of any sudden disruption, the waters of the Sum-gal would have rushed violently onward, cutting for themselves a deep channel in the soft bed of the lake. The Kyang-Tsho must have been

* See Plate IX. for these shells.

1: Cunningham G-3 (1846-47) 1854 AM W Tibetans AJ4

MOLLUSCA.

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The only existing mollusk I observed in Ladák was the *Lymnæa auricularia*. In Plate IX. I have given three specimens, from Pitak and Nubra in Ladák, and from Skardo in Balti. Beside them I have placed for comparison a specimen of the same mollusk from Kashmir; and above them two extinct specimens from the old lacustrine formations on the banks of the *Thogji Chenmo* and *Pangong* salt lakes. The superior size of the Kashmir specimen is perhaps no more than might be expected from the greater mildness of the climate; but that of the extinct species is most remarkable. The largest existing specimen from Pitak measures only six-eighths of an inch in length, and rather less than five-eighths in breadth; whereas the extinct specimens are upwards of an inch in length, and more than three-quarters of an inch in breadth.

These fresh-water fossil shells are found in a fine yellow sandy clay, many feet above the present level of the salt-water lakes. When they existed, the lake of Thogji Chenmo must have been a noble sheet of fresh water, upwards of forty miles in length by about twenty miles in extreme breadth, covering the whole plain of Kyung, from the foot of the Thung-Lung Pass to the rocky glen of the Sumgyel (triple junction) River. These fossil shells are now lying in myriads in the narrow pass between the old bed of the Thogji Lake and the plain of Kyung, and they are equally numerous in the upper part of the plain of Kyung.

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At what period these vast plains were covered with water will be an interesting subject of inquiry for the geologist; but the mind gets bewildered in trying

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans AJ4

to pierce the infinite obscurity of bygone ages. One point alone seems clear; that when all these lakes existed, more moisture must have been evaporated, and more snow must have fallen as well as more rain; and the humid atmosphere would have produced a milder climate more favourable to animal and vegetable life. The hills would, perhaps, have been clothed with trees, and the still waters of the magnificent lakes would have teemed with myriads of *Lymnæa*, of which only the shells now remain. But the gradual wearing down of the water-courses, and the continual bursting of the lakes, have nearly dried up all the primeval waters of Ladák; and the consequent loss of moisture has occasioned the present general scarcity of rain and snow, and that extreme dryness of atmosphere which has caused the total dearth of trees. The only sheets of water that now exist are landlocked and salt.

A second extinct species of shell is a bivalve (*Cyclas*); but as all the specimens that have been found were preserved inside the *Lymnæa*, they are necessarily small; it is now perhaps impossible to determine exactly whether they are river or lake shells.

Fossil shells are also found in the fine clay deposits near Skardo, of which I have given a specimen in Fig. 4, Plate IX., which contains a *Planorbis* and a *Luccinea* (or perhaps a small *Lymnæa*). One specimen of the existing Planorbis of Skardo is given in Fig. 9.

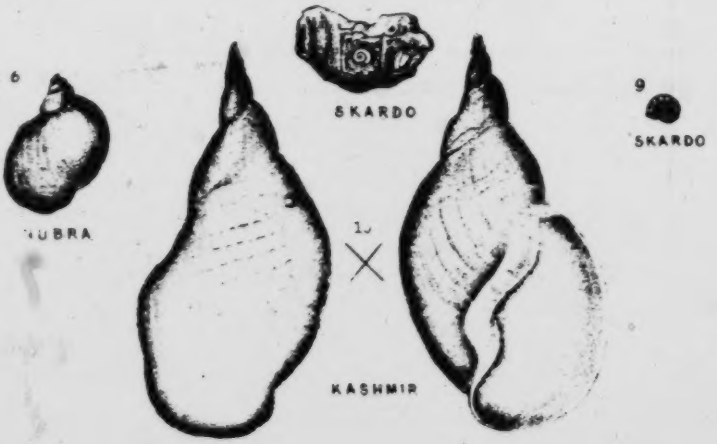
DOMESTIC ANIMALS.

The domestic animals of Ladák are ponies, asses, oxen, sheep, goats, and dogs. The Argons, or mixed race of half-Kashmiris half-Botis, resident at Lé, now keep a number of common fowls, but they have only

1: Cunningham G-3 (1846-47) 1854 AJ4 W. Tibetans

EXTINCT and EXISTING SHELLS.
from Ladak, Balti, and Kashmir.

TSHO-KAR (Lake) and PLAIN of KYANG.



A. Cunningham, del.

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2: Gervis T-3 (no date) 1954 AVI Kashmir AVI
W. Tibetans AJ 4

itself; the castle fort surmounting them must have been almost impossible to get at other than by alpine ropes. 361

The day following, we had our highest pass to cross and the easiest of them all. This was Fotu La at a height of thirteen thousand, four hundred feet. I had gone on, for I had seen ibex ahead—these are goat-like animals with coats varying in colour from cream to chocolate. On the summit I waited for the rest of the party while I admired the magnificent view, and watched them climbing up, so very slowly. Not until then did I appreciate the height we had reached and how it affected one by slackening movements. [133] [134]

From there it was a downhill road two thousand feet to Lamayaru along a watercourse tight in between gloriously coloured cliffs of most unusual shape; later we came on a valley with a stony path lined by prayer walls and dozens of chortens, the village being at the far end with a most interesting monastery built on the low hills above it.

The road on is along the bed of a narrow ravine, so narrow, with overhanging cliffs in places and the swift stream close on the other side, that one is forced to cross and recross almost the whole way. At the far end there is a bridge guarded by an old Dorga fort. Lamayaru has towering above it the ancient castle of Bragnag, built by King Naglug and dating back to A.D. 1150. 491 172

The great Buddhist monastery here is an astonishing place. It seems to consist of an enormous conglomeration of buildings, some of which might be carved out of the hill. There are narrow passages, steep staircases and unprotected ramparts; in parts there are tiny cells, in others large chapels with high-up windows and low benches; little recesses are cut in the walls, presumably for books. In one of these chapels there is a great image of Chubrezig which must be ten or twelve feet high; its background is a large circular plaque almost as high. The image has eleven heads, one on each side of that which is facing, and the others piled on top of them: it has a thousand hands spread out tier upon tier around the plaque, one of the larger pairs being held in prayer, another pair holding a rosary in one hand and a jewel in the other. 346 778

And from the roof of practically every house which sits at the foot of the hill, rag prayer flags fly, sending prayers to heaven, 788